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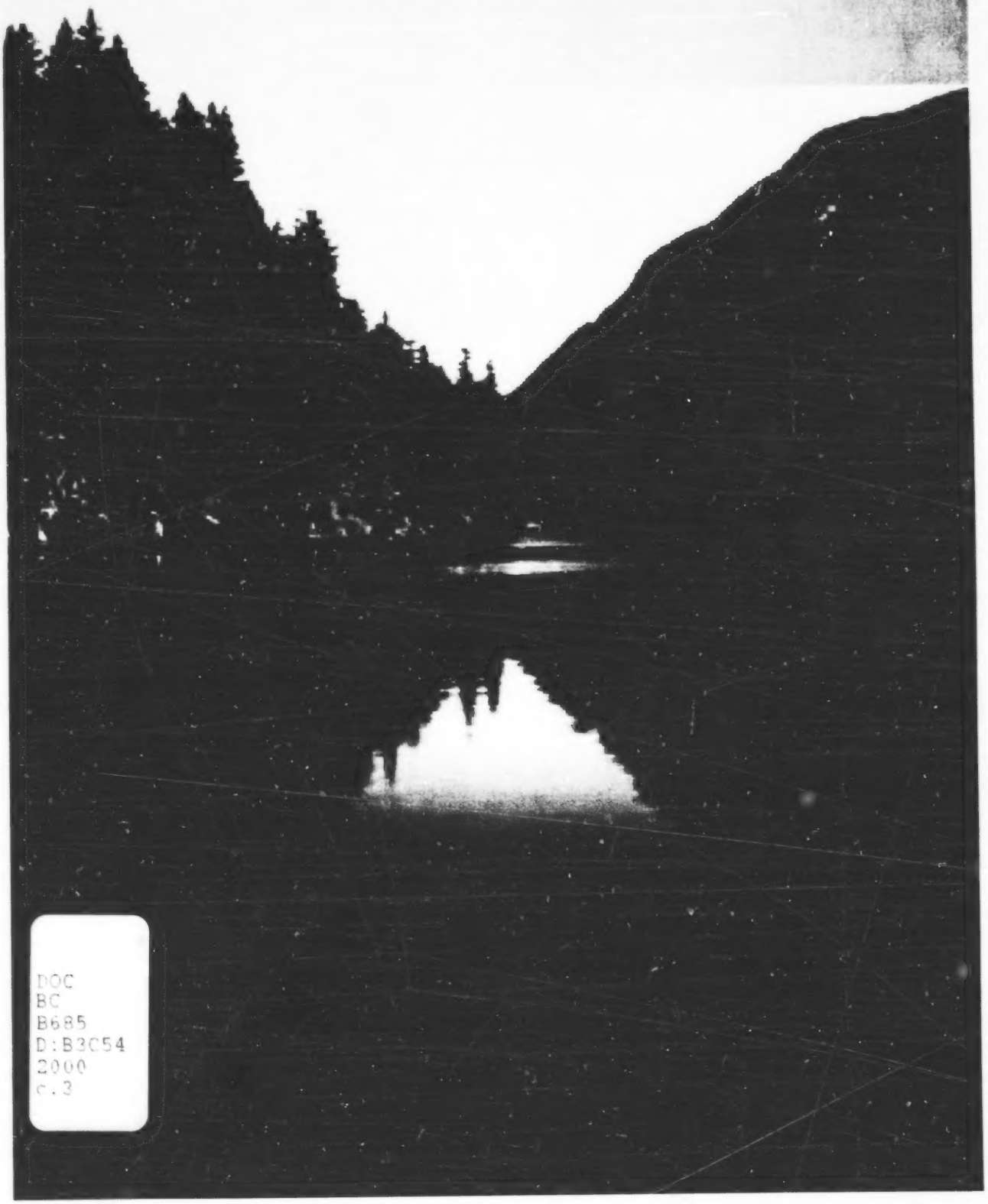
BC Hydro Climate Change Progress Report

September 2000



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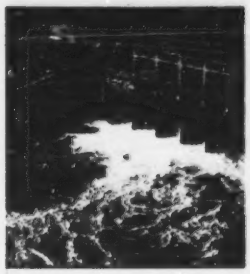
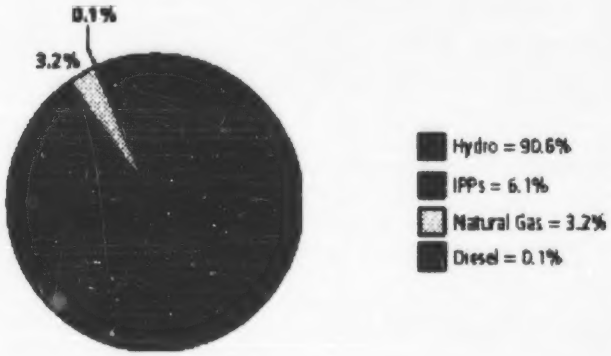
Cover photo: Buntzen Lake Reservoir (Anmore, B.C.).



Profile of BC Hydro

BC Hydro is the third largest electric utility in Canada, providing electricity and energy services to more than 1.5 million customers in British Columbia. We are a vertically-integrated utility with significant generation, transmission and distribution assets, managed by a highly skilled workforce of about 5,400 technical, professional and customer service specialists. Almost all of the energy we produce is hydroelectricity, generated with water collected in storage reservoirs at our 30 hydroelectricity installations. BC Hydro also operates three thermal-generating plants to augment hydroelectricity generation, plus a small number of diesel-generating stations to supply local power in remote areas of the province. Depending on weather conditions and other factors, approximately five to eight per cent of the energy supplied by the BC Hydro system is purchased from independent power producers (IPPs). Sources of this power include small hydro, woodwaste, and natural gas. Purchases from IPPs accounted for six per cent of the energy BC Hydro supplied to customers in 1999. Taking into account these power purchases, we supplied 53,721 GW·h of electricity to our customers in 1999, and 94 per cent of that was hydroelectricity.

BC Hydro System Power Supply (1999)



In 1999, over 90% of the power generated by BC Hydro was hydroelectric. In addition, three-quarters of the power we bought from IPPs was GHG-free, coming from hydroelectric or woodwaste sources. That means that over 94% of the power supplied from the BC Hydro system in 1999 was GHG-free.

1999 At A Glance

Greenhouse gas emissions down this year

BC Hydro's total greenhouse gas (GHG) emissions were substantially lower in 1999 than in 1998, declining 31 per cent to 1,394 kilotonnes of carbon dioxide equivalent (kt CO_2e) (see glossary).

Emissions from our own power generation activity totaled 939 kt CO_2e, a 38 per cent decrease from last year, while emissions from independent generators who sell power to BC Hydro were down 16 per cent, to 329 kt CO_2e.

Other GHG emissions from our operations, such as motor vehicle use, space heating at office buildings, and SF_6 losses from transmission equipment, decreased slightly by two per cent to 127 kt CO_2e.

Emission reduction highlights

- **Customer Efficiencies** — Energy-efficiency programs promoted by Power Smart achieved 2,312 GW·h in annual energy savings, equivalent to 1,226 kt CO_2e in avoided GHG emissions.
- **Internal Efficiencies** — New energy gains from the redevelopment of Stave Falls totalled 77 GW·h and avoided 307 kt CO_2e of emissions.
- **Improvements at Burrard** — The ongoing upgrade project at our Burrard Generating Station achieved GHG emissions reductions of 5 kt CO_2e.
- **Cleaner Power** — A new, efficient natural gas turbine generator in Fort Nelson, BC, replaced local service from more GHG-intensive power imported from Alberta. The project reduced GHG emissions by 58 kt CO_2e.

New this year: Offsets

- **GHG emissions offsets** — We completed our first offsets purchase in 1999. We are buying the GHG emissions reductions from a project that involves capturing methane gas at a landfill in Surrey, BC, and blending it with natural gas to help power a wallboard manufacturing plant. BC Hydro will purchase up to 33 kt CO_2e of GHG emissions reductions over the 14-year span of the agreement.
- **Carbon sequestering** — Wetlands we have been creating at our Upper Arrow Reservoir are capturing and storing carbon. To date, we have stored 64 kt CO_2e of carbon over a nine-year period.

Message from the President & CEO

GHG Emissions Significantly Lower in 1999

I am pleased to submit BC Hydro's Climate Change Progress Report for calendar year 1999 to Voluntary Challenge and Registry (VCR) Inc. This is our fourth annual report on the activities and results of our greenhouse gas management program. With this, we continue documenting the success of an extensive range of actions BC Hydro has undertaken to achieve emissions reductions: saving energy internally, helping our customers do the same, and starting to develop a portfolio of emissions offsets.

We are proud to report a significant reduction in our greenhouse gas (GHG) emissions in 1999, compared to the levels recorded in 1998. Ongoing internal and external activities to minimize our emissions contributed to a 31 per cent decline in GHG contributions over the calendar year.

Weather, customer demand for energy and other factors beyond our control share much of the responsibility for the reduction. Our generating system is dominated by GHG-free hydropower — we are more than 90 per cent hydro — yet our GHG emissions typically fluctuate according to water inflows. Since reservoir levels dictate how much hydropower we can supply, and the amount of fossil-fuel generation that may be required to meet demand.

In early 2000, we resolved to meet 10 per cent of our load growth in the next 10 years with alternative, 'green energy' resources that are renewable, socially responsible and have a low environmental impact. BC Hydro's senior management has assigned high priority to exploring and developing these options.

As documented in our 1995 Climate Change Action Plan and our subsequent annual reports to VCR Inc., BC Hydro has systems in place to track our GHG emissions, programs to effect emission reductions, and mechanisms to review and revise our strategy as needed. BC Hydro has also established a target for GHG emission reductions, together with strong support from senior management for continued emphasis on action to reach our goals.

We will continue to provide VCR Inc. with regular documentation of our efforts to manage the growth of our GHG emissions.

Yours very truly,

Michael Costello
President and Chief Executive Officer
BC Hydro

Our Climate Change Plan

BC Hydro joined the Voluntary Challenge and Registry (VCR) program when it began in 1995, by filing a Preliminary Greenhouse Gas Action Plan documenting our long-term commitment to manage GHG emissions. Our annual climate change reports outline targets and initiatives to cut emissions, and record the progress made towards our goals.

Our climate change plan recognizes the unique challenge facing BC Hydro: despite our best efforts, our level of GHG emissions, currently among the lowest of Canada's utilities, is expected to increase because of growth in demand for electricity. Environmental, social and economic considerations have determined that most of this projected growth will be met not by expanding our hydroelectric capacity, but by adding to our natural gas-fired capacity.

However, we remain committed to limiting the growth of GHG emissions from our electrical system, wherever economically feasible. Actions underway to manage our GHG emissions include measures directed at BC Hydro's internal operations, customers, power purchases, and emissions offsets at other locations.

Stretching our resources — We are working to squeeze every watt of electricity we can from the resources already at hand, in order to maximize energy output from our GHG-free hydro facilities. Resource Smart, our internal efficiency program, improves the operational effectiveness of hydro plants across our system.

Helping our customers save — Our Power Smart program of energy-efficiency initiatives helps residential customers and businesses use energy wisely, stretching electricity resources among more users and lessening the need for additional power.

Choosing cleaner power — When upgrading or adding to our mix of energy supply options, we make a point of encouraging generation with zero or minimal GHG emissions, and are committed to meeting 10 per cent of our new load growth with green energy resources.

Offset investments — BC Hydro is seeking opportunities to invest in emission offsets: projects that mitigate GHG emissions at one source by lowering, avoiding or sequestering (capturing and storing) emissions at another source.

Promoting sustainability — We participate actively in the development of provincial and national GHG strategies through the National Climate Change Process, the Greenhouse Gas Emission Reduction Trading (GERT) pilot, and BC's Greenhouse Gas Forum. We are also committed to employee and public education to promote efficient and sustainable energy uses.

Setting a target — Our ongoing long-term resource planning and corporate strategy development processes include provisions for establishing, revising and updating targets for reducing GHG emissions. BC Hydro's revised target is a GHG emission reduction of 26,000 kt CO_2e between 1989 and 2000. This is lower than our previously established target of 30,000 kt CO_2e over the same period. Our revised target reflects the correction of a previous over-estimate of internal energy gains and the resulting emissions reductions. To date, we have reduced our emissions by 22,943 kt CO_2e and anticipate achieving our revised target in 2000.

More detailed information about each of the elements of our Greenhouse Gas Action Plan is contained in the remainder of the report.

"We see ourselves as accountable to improve our own performance and to act as a catalyst for positive change in others. In this way we believe we can help build a sustainable society."

Michael Costello
President and CEO
BC Hydro 1999 Triple Bottom Line Report

Our Emissions

BC Hydro generates, purchases and distributes electrical power within British Columbia. Most of the power we supply is generated at our own facilities and we buy energy from independent power producers (IPPs) to provide the rest. Depending on supply, demand and market prices, we also trade power with Alberta and the United States through Powerex, our wholly owned power marketing and trade subsidiary.

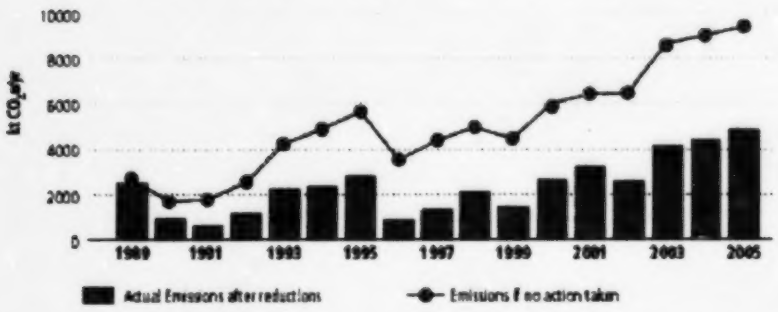
When our power purchases from IPPs are taken into account, 94 per cent of the power supplied by the BC Hydro system in 1999 was GHG-free hydro power, and the remainder was from thermal sources. Power from hydro sources is not considered a source of GHG emissions.

Direct emissions result from BC Hydro's own generation and business activities. Most are from fossil fuel combustion at three thermal facilities we operate to augment regular hydroelectricity production. A lesser proportion results from operating a number of small diesel-generating stations which supply local power to isolated BC communities. Together, these facilities accounted for 939 kt CO_2e or 67 per cent of our GHG emissions. Direct emissions from our non-power activities (motor vehicle use, heating our buildings, and SF_6 losses from transmission equipment) accounted for a further 127 kt CO_2e or nine per cent of our GHG emissions in 1999.

Indirect emissions are associated with the activities of other companies supplying power to BC Hydro. All of our indirect GHG emissions are tied to the fossil fuel generated power we buy from BC-based IPPs and from utilities in Alberta. Energy purchases accounted for 329 kt CO_2e or 24 per cent of our total GHG emissions in 1999.

BC Hydro's actual greenhouse gas (GHG) emissions from direct and indirect sources totaled 1,394 kt CO_2e in 1999.

Total BC Hydro System Emissions (1998 - 1999)



The bars above represent the actual emission for years 1989 through 1999 and projected from 2000 onward. They show considerable year-to-year variability reflecting the changes in water availability and fossil fuel generation. The line above the bars represent the level of emissions we would have reached if we had not taken action to reduce our emissions.

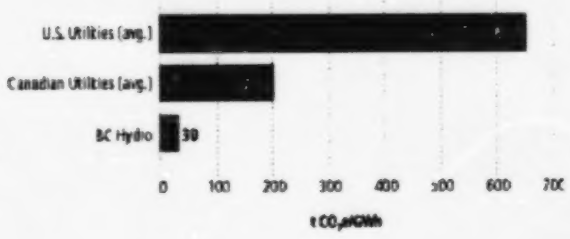
Small contributor of GHG emissions

With a power system dominated by hydroelectric generation (both our own, and our IPPs) BC Hydro is among the smallest contributors of GHG emissions in the North American electricity industry:

- we are responsible for 1.2 per cent of the GHG emissions generated by Canada's electricity industry, and only 0.2 per cent of Canada's total GHG emissions
- the GHG intensity of our power is among the lowest in North America: 84 per cent lower than the Canadian average, and 95 per cent lower than the U.S. average.

Comparing GHG Intensities

(a measure of GHG emissions per unit of electricity generated)

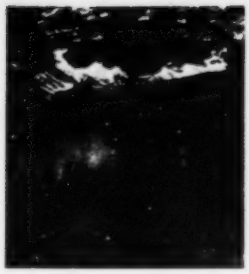


Power supplied by the BC Hydro system, which includes power purchases, has a very low GHG intensity. It is well below the Canadian and U.S. average GHG intensity values as shown in the chart above.

Emissions will rise

The low GHG intensity of our power and our total GHG emissions are both expected to rise in coming years as demand for electricity increases in British Columbia. Environmental, social and economic considerations have determined that our growth in energy demand will probably be met by natural gas, not large-scale hydroelectricity projects. This emphasis on gas sources poses a significant challenge to efforts to reduce the growth of our GHG emissions.

We recognize that it may be difficult to reduce or contain the level of our GHG emissions, given projected growth in energy demand and the cost-effective resources available to meet that demand. At the same time, we are striving to find economically feasible ways to limit the growth of our GHG emissions.



Helping Our Customers Save

Energy efficiency makes sense, for BC Hydro and for our customers. Our portfolio of Power Smart programs encourages wise use of electricity to help people and businesses stretch their energy dollars as far as possible, and to slow the growth rate of energy consumption in BC.

Equally important is the wise use of the hydropower-dominated energy resources already available to us to help BC Hydro limit additions of fossil-fuel-based generation and avoid the resulting increase in GHG emissions.

Annual energy savings achieved by Power Smart totaled 2,312 GW•h in 1999, equivalent to 1,226 kt CO_2e a year in avoided emissions. Since the program started in 1989, Power Smart has helped us avoid 8,605 kt CO_2e.

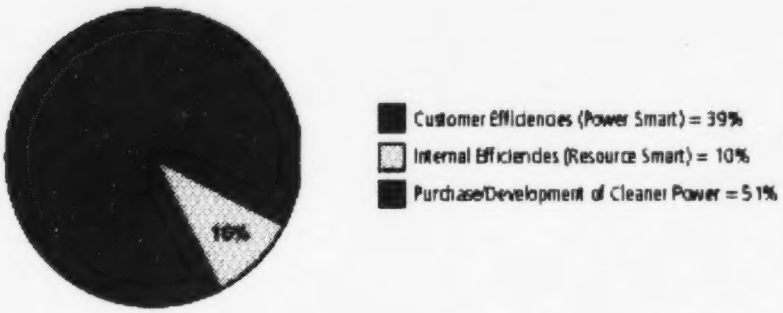
Reducing power use in homes
Several programs are in place to promote knowledge of power-saving opportunities among residential customers, and to help people reduce their energy costs. Through the Home Improvements Program, BC Hydro-registered contractors identify energy savings opportunities and perform the work to Power Smart standards. BC Hydro also partners with trade allies to increase the comfort levels and energy savings in new homes, and to promote Power Smart products targeted at residential customers.

Energy management for business
A variety of programs have been established to help business customers understand and manage their energy use and improve energy efficiency. Key initiatives include building audits to identify opportunities for cost savings in existing structures and design reviews to explore energy-efficiency potential in new commercial and institutional buildings. We also offer state-of-the-art building monitoring to analyze energy use patterns.

Developing energy efficiency standards

BC Hydro supports municipal, provincial and federal efforts to develop and implement technical standards and rating methods for products that use energy. For example, we are working with the Canadian Standards Association and on the new National Energy Codes for houses and buildings, to review and update energy efficiency standards for appliances and other commercial and industrial products that use large quantities of energy.

1999 Breakdown of Emission Reductions


10%
Customer Efficiencies (Power Smart) = 39%
Internal Efficiencies (Resource Smart) = 10%
Purchase/Development of Cleaner Power = 51%

In 1999, most of our emission reductions came from our purchasing and developing cleaner power, and from helping our customers save energy through our Power Smart programs. We purchased GHG-free power from hydro and woodwaste IPPs. We also installed a new natural gas fired plant in Fort Nelson displacing the more GHG-intensive power we used to import from Alberta to provide local service. We achieved the remaining 10 per cent of our emission reductions by improving the efficiency of our own facilities.

Stretching Our Resources

We are squeezing more energy from existing plants by increasing the efficiency of our generation. Work to boost energy output from resources already at hand is directed to both our GHG-free hydropower facilities and our thermal plants. Below are highlights of some of the improvements made at our hydropower and fossil fuel generating facilities last year, as well as other steps taken to minimize GHG emissions from our operations.

Resource Smart additions

Resource Smart is BC Hydro's program to increase the energy capabilities of our hydro-based system by improving equipment efficiencies at existing plants. Efficiencies can include redeveloping entire power plants at older facilities, adding new generating units, or upgrading turbine runners to boost annual energy output. Since its launch in 1987, Resource Smart has collected cumulative annual energy gains of 578 GW·h per year and 2,052 kt CO_2e in avoided GHG emissions.

New energy gains in 1999 included 77 GW·h realized from replacing the Stave Falls power plant, resulting in 307 kt CO_2e in avoided GHG emissions. Stave Falls is the middle of three hydroelectric power facilities on the same river system (Allouette–Stave Falls–Ruskin). The original Stave Falls power plant, a 52.5 MW facility built in 1911, was replaced in 1999 by a new two-unit, 90 MW installation. The increased energy capability at the new plant helps us meet growing demand for electricity in the region.

Improvements at Burrard Generating Station

We continue to address the environmental performance and efficiency of power-producing equipment at Burrard Generating Station, the natural gas-fired facility near Vancouver that is BC Hydro's principal source of thermal power. Ongoing improvements at Burrard Generating Station achieved GHG emission reductions of 5 kt CO_2e in 1999. Reductions total 22 kt CO_2e since 1994, when improvement work began.

Avoided Emissions from Transmission

We are continually finding ways to reduce emissions by improving the way we operate. Some of the key opportunities we are pursuing in our transmission and distribution system are:

Minimizing SF_6 losses

Sulphur hexafluoride (SF_6), a potent greenhouse gas that is used as an insulating and protective gas used in transmission equipment, can escape from worn or leaking seals in high-voltage equipment, or during routine handling. We formed a working group in 1997 to develop systems to improve SF_6 tracking and identify ways to reduce losses, which in 1999 led to new monitoring, installation and handling practices. Information collected by the improved system will help us develop a more detailed SF_6 management plan to minimize losses and the resulting emissions.

Maximizing energy deliveries

We continue to investigate ways to reduce energy losses when power is transmitted along our powerlines. Reducing line losses lets us deliver more electricity to customers and minimizes the additional fossil-fuel generation needed to cover shortfalls. Leading-edge technologies being adopted include on-line equipment condition monitoring and advanced computer applications for power system planning and operation.

Saving trees with wood pole management

BC Hydro extends the life of wooden utility poles wherever possible. This lessens demand for harvesting trees that would otherwise store carbon. Keeping our poles in service and safe involves stubbing or securing deteriorated poles by installing a steel beam or short piece of wood pole at the base of the pole. We also recycle approximately 4,000 poles taken out of service each year, recovering about 60 to 75 per cent of the wood for other uses by the public and BC Parks, including park benches, picnic tables and gazebos. Recycling also means we are sending less waste to landfills, where it would generate methane emissions.

Choosing Cleaner Power

BC Hydro is exploring opportunities to develop new sources of cleaner energy, or purchase it from others, to help meet the growth in demand for electricity from our system. In some cases, we are replacing existing generation from higher emitting sources, such as diesel, with cleaner power.

Developing green energy

In January 2000, BC Hydro announced a bold plan to meet up to ten per cent of our new load growth in the next 10 years with new green energy. In the absence of a standard definition of green energy, BC Hydro has established criteria that we will use to choose which green projects to invest in. For example, the green resources must be renewable and socially responsible, and have a low environmental impact. The most immediately available green energy includes small hydro and woodwaste since both meet the key criteria and are closest to being cost-competitive with other options available to BC Hydro. In future, technologies to generate electricity from solar and wind sources may also be viable as they become cost-competitive.

Building Energy Futures

The Energy Futures program was established in late 1998, with a focus on identifying realistic green energy options for BC, including green energy supplies, new products or services, partnerships and new business ventures. The program looks at proven or near commercial technologies and their potential application in our system. The focus of key Energy Futures initiatives is on wind energy, micro hydro, woodwaste utilization, community energy planning, and green labelling for industrial and commercial customers. Energy Futures pinpoints energy sources available to BC Hydro now and helps to advance new, green technologies and opportunities for the near future.

Researching alternative energy sources

Our Strategic Research and Development (SRD) program continues to champion innovative research and assessment for new technologies. By looking at a range of advanced thermal and alternative energy resources and applications, they are helping us find more ways to reduce our emissions. Among the SRD projects is a partnership to install building-integrated photovoltaic (PV) panels into two buildings at the campus of the BC Institute of Technology (BCIT). Another research project involves developing new optical-sensing devices to measure electrical voltage and current in substations, replacing traditional equipment that uses the greenhouse gas sulfur hexafluoride (SF_6) for insulation.

Replacing diesel in remote areas

Fort Nelson is a remote community in north-eastern BC that is not connected to our provincial energy grid. Since 1991, following two decades of service from local stand-alone diesel generators, the community's energy needs have been met by energy imports from fossil fuel-based utilities in Alberta. In 1999, we partnered with TransAlta, an energy utility in Alberta, to install a 45 MW natural gas turbine generator in Fort Nelson. The new facility provides enough power to meet local energy needs for the next 20 years, as well as surplus electricity for export to Alberta. Once the new plant began operating in spring 1999, it reduced our GHG emissions by 58 kt CO_2e over the remainder of the year by producing energy that is less-GHG-intensive than the power previously imported from Alberta. Surplus electricity exported from Fort Nelson provided additional GHG emissions reductions by displacing more GHG-intensive generation from fossil fuel sources in Alberta.

Dease Lake is another remote community in north central BC not connected to our provincial energy grid. In December 1999, power from our local diesel-generating station was replaced with power from a small independently owned hydro plant. The switch from diesel to hydropower reduced our GHG emissions for the year by 0.24 kt CO_2e.

Purchasing cleaner power

The independent companies generating electricity for sale to BC Hydro include a number who produce their energy from clean power sources, typically small hydro plants and woodwaste. We purchased 3,217 GW·h of this cleaner energy from IPPs in 1999 and avoided 1,485 kt CO_2e in GHG emissions as a result, since the purchases displaced fossil-fuel generation at our thermal plants.

GHG Emission Offsets

BC Hydro has limited cost effective opportunities to slow the growth of emissions from our power generating system, which already ranks as one of the most GHG-efficient in North America. Realizing this, we are looking beyond our own operations to identify and develop opportunities to abate future emissions growth.

Investing in offsets is one part of our strategy for reducing our contribution to global emissions. An offset is a project that "offsets" excess emissions at one source by lowering, avoiding, or sequestering (capturing and storing) emissions at another location.

First offsets purchase involves landfill gas

In 1999 we committed to our first offset project at the Port Mann landfill in Surrey, just east of Vancouver. The project involves capturing methane gas from the landfill and delivering it to Georgia Pacific Canada Inc.'s wallboard manufacturing plant in nearby Delta, where it is blended with natural gas and used as fuel in the plant's burners. BC Hydro will purchase up to 33 kt CO_2e of GHG emission reductions over the 14-year span of the agreement.

Storing carbon in our reservoirs

We have been working to create new wetlands in the drawdown zone at Upper Arrow Reservoir, south of Revelstoke, in order to reduce the incidence of dust storms and provide more wildlife habitat. Over time, the growth of plants and their root development and decay will increase the organic content of the soil, sequestering carbon in the wetland. Initial estimates are that we could sequester up to 3,900 kt CO_2e as the wetland matures over 50 years. The project has captured 64 kt CO_2e of carbon since it began in 1991.

Exporting cleaner power

BC Hydro's electricity trade with neighbouring utilities in Alberta and the Western U.S. has risen dramatically since 1996. Although we do not currently report on the full GHG impact of our electricity trade, we are a net exporter of electricity. Since our hydropower-dominated exports typically displace thermally-generated power, overall, trade activities reduce global GHG emissions. In fact, in at least half of the years in the last decade, BC Hydro system emission reductions due to net exports have likely helped lower global GHG emissions.

Policy Development

Establishing and maintaining dialogue with governments, industry groups and stakeholder organizations is another key element of BC Hydro's GHG strategy. These consultations and information exchanges allow us to participate in developing practical climate change solutions at the provincial and federal levels.

Under the Kyoto agreement, an international accord reached among 160 countries, Canada is one of 38 industrialized nations pledging to reduce their collective GHG emissions by five per cent below 1990 levels by 2012. Canada's contribution to the effort would be a commitment to lower national emissions by six per cent below 1990 levels. It is not yet clear whether the Kyoto Protocol will enter into force, and the uncertainty over its fate is expected to continue until at least 2002.

In response to the Kyoto Protocol, Canadian governments initiated a cross-country consultation process to develop a national strategy on climate change. That process is moving towards the fall 2000 meeting of federal and provincial ministers that is expected to approve a near-term climate change strategy for the country. However, a decision on Canadian ratification of the Kyoto Protocol is not expected until 2002-2003.

In 1999, we remained actively involved in helping to shape Canada's climate change by:

- working with the **Canadian Electricity Association** (CEA) and **Canadian Hydropower Association** (CHA) to develop climate change policy proposals for national and international consideration
- representing the CEA in the **Greenhouse Gas Emission Reduction Trading** (GERT) pilot program, a four-year multi-stakeholder process designed to examine emission reduction trading as a market-based mechanism to address the climate change challenge
- advising the BC government on climate change policy as a member of the **BC Greenhouse Gas Forum**, comprised of representatives from industry, labour, environmental groups, and provincial and local agencies
- being a member of the **Greenhouse Emissions Management Consortium** (GEMCo), a not-for profit alliance of leading Canadian energy companies committed to providing leadership in developing voluntary and market-based approaches to managing GHG emissions
- participating in multi-stakeholder consultation programs established by the federal, provincial and territorial governments to develop a **national climate change strategy**.

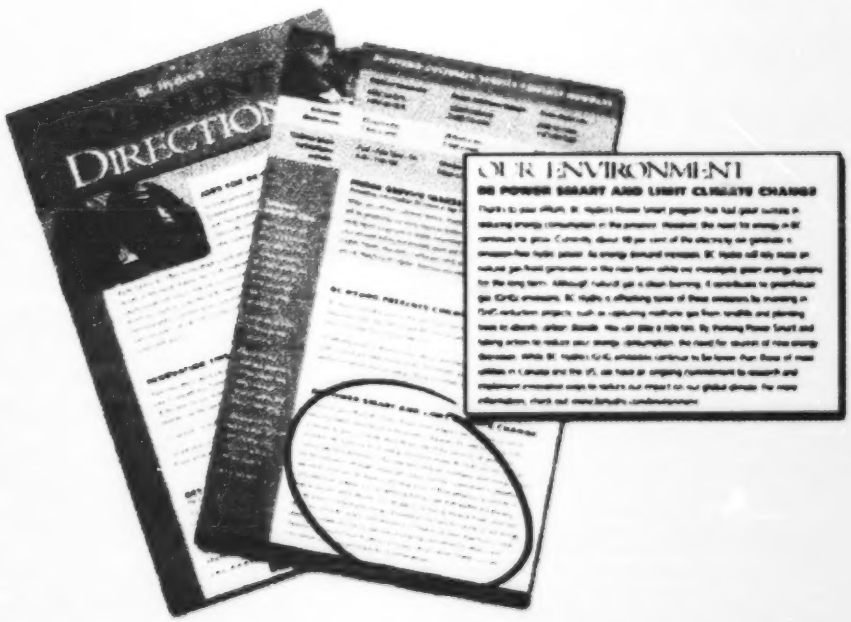
Communicating About Climate Change

Communication and awareness are important parts of BC Hydro's strategy to manage GHG emissions. We encourage greater understanding of climate change, effective dialogues about solutions, and shared responsibility for actions. Our climate change education and awareness efforts include extensive communication with customers, BC Hydro employees, students, advocacy organizations, and government agencies. We communicate through written publications, video, posters, education kits for schools, and our Internet site.

Public access to information

Our Climate Change Progress Reports are available on-line on our Internet site (www.bchydro.com/environment/reports.html). Visitors to our site can also review links to other sources of information about climate change and GHGs.

Our GHG emission strategies and actions are published in our annual Triple Bottom Line report, which documents BC Hydro's progress towards sustainability, and in our annual report to the Canadian Electricity Association's Environmental Commitment and Responsibility program, which records and measures our environmental performance in a number of areas, including climate change.



One of BC Hydro's recent bill inserts included a section letting our customers know that by taking individual action to save energy, they play an important role in helping us slow the growth of our GHG emissions.

Education materials
BC Hydro worked with the public and private sectors in 1999 to produce materials promoting action on climate change:

- we partnered with federal and provincial government agencies to develop the Temperature Rising poster to promote action on climate change issues in BC high schools.
- we helped to fund a BC supplement to the Pembina Institute for Appropriate Development's Climate Change Awareness and Action Education Kit for high school teachers and students. We also partnered with the Pembina Institute to market the kit to BC teachers, including sponsoring a two-day conference.

Reaching the public on Climate Change
In 1999, BC Hydro committed $25,000 to sponsor the Energy Council of Canada's "Action by Canadians" (ABC) program. The program aims to educate and motivate Canadians to reduce their personal contribution to GHG emissions by making lifestyle choices to alter their consumer and household behaviours.

Awareness effort invites employees to participate
We encourage employees to use alternative forms of transportation when commuting to and from work. This year, we sponsored and promoted Bike to Work Week activities during Environment Week. We also provide bicycle lockup, shower facilities and a bike buddy system for cyclists, and a matching service for employees who want to carpool.

Information about climate change was communicated to BC Hydro employees in 1999 through a series of articles in print and electronic publications, and through a GHG-emissions information sheet. Employees are also invited to visit our internal web site to review the electronic version of BC Hydro's Climate Change Progress Report, or access an electronic library of other climate change reference and research material we have assembled.

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Greenhouse Gas Inventory (1989 - 2005)

		[redacted]										Forecast					
												2000	2001	2002	2003	2004	2005
Emissions if No Action Taken																	
BC Hydro facilities (direct)		2,726	1,725	1,803	2,492	4,003	3,996	3,988	3,121	3,955	4,003	4,075	4,107	4,107	4,107	4,107	4,107
Power purchases from non-BC Hydro facilities (indirect)		0	0	8	84	212	908	1,689	411	426	918	343	1,779	2,303	2,320	4,517	4,966	5,276
TOTAL EMISSIONS IF NO ACTION TAKEN	**A**	**2,726**	**1,725**	**1,811**	**2,576**	**4,215**	**4,904**	**5,677**	**3,531**	**4,381**	**4,920**	**4,417**	**5,887**	**6,411**	**6,427**	**9,624**	**9,014**	**9,384**
Internal Emission Reductions																	
Customer Efficiencies (Power Smart)		34	118	316	514	727	902	1,034	1,193	1,297	1,246	1,226	1,104	933	894	805	724	652
Internal Efficiencies (Resource Smart, Burrard)		11	111	143	162	173	191	218	239	241	273	311	371	373	642	735	807	869
Purchase / development of low GHG intensity power		203	587	752	763	1,098	1,552	1,640	1,245	1,570	1,369	1,485	1,719	1,863	2,321	2,937	2,992	3,017
TOTAL INTERNAL EMISSION REDUCTIONS	**B**	**248**	**816**	**1,211**	**1,439**	**1,998**	**2,645**	**2,893**	**2,677**	**3,108**	**2,887**	**3,023**	**3,193**	**3,229**	**3,857**	**4,476**	**4,521**	**4,538**
Cumulative Internal Emission Reductions		248	1,064	2,275	3,713	5,711	8,356	11,249	13,926	17,033	19,921	22,943	26,137	29,366	33,223	37,699	42,220	46,758
Actual Emissions																		
BC Hydro facilities (direct)		2,479	909	592	1,053	2,071	1,899	2,398	444	847	1,640	1,065	2,026	2,252	1,385	2,462	2,805	3,155
Power purchases from non-BC Hydro facilities (indirect)		0	0	8	84	146	360	387	411	426	393	329	667	929	1,186	1,692	1,692	1,692
TOTAL ACTUAL EMISSIONS	**C = A - B**	**2,479**	**909**	**600**	**1,137**	**2,217**	**2,259**	**2,785**	**854**	**1,273**	**2,033**	**1,394**	**2,693**	**3,181**	**2,570**	**4,154**	**4,497**	**4,848**
Actual GHG Intensity (t/GW•h)		55	19	12	22	47	46	61	15	23	37	26	46	58	46	69	74	78
Offsets																		
Emission reduction purchases		0	0	0	0	0	0	0	0	0	0	0	1.7	1.7	1.7	1.7	1.7	1.7
Carbon sequestration at BC Hydro reservoirs		0	0	1	1	2	3	4	7	11	15	20	25	30	35	40	45	50
TOTAL OFFSETS	**D**	**0**	**0**	**1**	**1**	**2**	**3**	**4**	**7**	**11**	**15**	**20**	**26.7**	**31.7**	**36.7**	**41.7**	**46.7**	**51.7**
NET EMISSIONS AFTER OFFSETS	**E = C - D**	**2,479**	**909**	**599**	**1,136**	**2,215**	**2,256**	**2,781**	**847**	**1,262**	**2,018**	**1,374**	**2,666**	**3,150**	**2,534**	**4,112**	**4,450**	**4,796**
Net GHG Intensity (t/GW•h)		55	19	12	22	47	46	61	15	23	37	26	46	57	46	68	73	78

Note: All amounts shown in kilotonnes of carbon dioxide equivalent (kt CO_2e) unless otherwise indicated

Greenhouse Gas Inventory (1989 - 2005)

													Forecast					
													2000	2001	2002	2003	2004	2005
Emissions if No Action Taken																		
BC Hydro facilities (direct)		2,726	1,725	1,803	2,492	4,003	3,996	3,988	3,121	3,955	4,003	4,075	4,107	4,107	4,107	4,107	4,107	4,107
Power purchases from non-BC Hydro facilities (indirect)		0	0	8	84	212	908	1,689	411	426	918	343	1,779	2,303	2,320	4,517	4,906	5,276
TOTAL EMISSIONS IF NO ACTION TAKEN	**A**	**2,726**	**1,725**	**1,811**	**2,576**	**4,215**	**4,904**	**5,677**	**3,531**	**4,381**	**4,920**	**4,417**	**5,887**	**6,411**	**6,427**	**9,624**	**9,014**	**9,384**
Internal Emission Reductions																		
Customer Efficiencies (Power Smart)		34	118	316	514	727	902	1,034	1,193	1,297	1,246	1,226	1,104	993	894	805	724	652
Internal Efficiencies (Resource Smart, Burrard)		11	111	143	162	173	191	218	239	241	273	311	371	373	642	735	807	869
Purchase / development of low GHG intensity power		203	587	752	763	1,098	1,552	1,640	1,245	1,570	1,369	1,485	1,719	1,863	2,321	2,937	2,990	3,017
TOTAL INTERNAL EMISSION REDUCTIONS	**B**	**248**	**816**	**1,211**	**1,439**	**1,998**	**2,645**	**2,893**	**2,677**	**3,108**	**2,887**	**3,023**	**3,193**	**3,229**	**3,857**	**4,476**	**4,521**	**4,538**
Cumulative Internal Emission Reductions		248	1,064	2,275	3,713	5,711	8,356	11,249	13,926	17,033	19,921	22,943	26,137	29,366	33,223	37,699	42,220	46,758
Actual Emissions																		
BC Hydro facilities (direct)		2,479	909	592	1,053	2,071	1,899	2,398	444	847	1,640	1,065	2,026	2,252	1,385	2,462	2,805	3,155
Power purchases from non-BC Hydro facilities (indirect)		0	0	8	84	146	360	387	411	426	393	329	667	929	1,186	1,692	1,692	1,692
TOTAL ACTUAL EMISSIONS	**C = A - B**	**2,479**	**909**	**600**	**1,137**	**2,217**	**2,259**	**2,785**	**854**	**1,273**	**2,833**	**1,394**	**2,693**	**3,181**	**2,570**	**4,154**	**4,497**	**4,848**
Actual GHG Intensity (t/GW•h)		55	19	12	22	47	46	61	15	23	37	26	46	58	46	69	74	78
Offsets																		
Emission reduction purchases		0	0	0	0	0	0	0	0	0	0	0	1.7	1.7	1.7	1.7	1.7	1.7
Carbon sequestration at BC Hydro reservoirs		0	0	1	1	2	3	4	7	11	15	20	25	30	35	40	45	50
TOTAL OFFSETS	**D**	**0**	**0**	**1**	**1**	**2**	**3**	**4**	**7**	**11**	**15**	**20**	**26.7**	**31.7**	**36.7**	**41.7**	**46.7**	**51.7**
NET EMISSIONS AFTER OFFSETS	**E = C - D**	**2,479**	**909**	**599**	**1,136**	**2,215**	**2,256**	**2,781**	**847**	**1,262**	**2,818**	**1,374**	**2,666**	**3,150**	**2,534**	**4,112**	**4,450**	**4,796**
Net GHG Intensity (t/GW•h)		55	19	12	22	47	46	61	15	23	37	26	46	57	46	68	73	78

Note: All amounts shown in kilotonnes of carbon dioxide equivalent (kt CO_2e) unless otherwise indicated.

Greenhouse Gas Inventory – A Guided Tour

The following sections describe how we arrived at the numbers in the highlighted rows in our inventory on the previous page. Also included are sections describing the methods used to select our representative base year, to calculate our emissions by gas type, and to categorize our emission reductions.

Emissions If No Action Taken (Line A)

Figures along Line A represent a projection of what BC Hydro's emissions would have been if we had not taken any action to reduce our emissions. That is, if BC Hydro had not implemented energy efficiency programs (Power Smart and Resource Smart) and had not purchased any low GHG-intensity power, more power would have been generated at low-efficiency gas-fired generating plants, resulting in higher GHG emissions. This measure is calculated by adding our internal reductions (line B) to our actual emissions (line C) described below.

Internal Emission Reductions (Line B)

Emission reductions from our internal efficiency initiatives (Resource Smart and ongoing improvements at Burrard Generating Station), customer efficiency programs (Power Smart), and low-GHG intensity power purchases are calculated by multiplying the amount of energy saved or generated (in GW•h) by an emission factor (in tonnes per GW•h). The emission factor is calculated based on the assumption that the energy saved or generated through these initiatives displaces a low-efficiency gas-fired generation source somewhere in western North America. Low efficiency gas-fired generating plants are typically the marginal resource in the western grid, while hydro, coal-fired and nuclear plants are operated as baseload resources. At times, this source would be BC Hydro's Burrard Generating Station; at others, it would be a gas facility elsewhere in Alberta or the western United States.

To calculate an emission factor for the displaced power from low-efficiency gas-fired generation, we assume that it is either a single cycle gas turbine or a steam boiler that is 34 per cent efficient. Energy savings from Power Smart and Resource Smart, and energy supplied by GHG-free and GHG-neutral IPPs (e.g., hydro, woodwaste) avoid all the emissions from the gas-fired generation that they displace. Energy supplied by IPPs operating high-efficiency gas-fired generation avoids the difference between high- and low-efficiency gas-fired generation.

Our emissions inventory contains new figures for historic and projected emission reductions from our various internal efficiency programs. While confirming 1999 figures for these initiatives, we discovered an error in our accounting that meant we were over-estimating its energy gains and emissions reductions. This year's table reflects corrected figures for the entire 1989-2005 period.

Greenhouse Gas Inventory – A Guided Tour (continued)

Actual Emissions (Line C)

Actual emissions for the BC Hydro System (Line C of the emissions inventory table) represents the sum of direct and indirect emissions.

BC Hydro System Emissions = direct emissions + indirect emissions

Direct emissions result from BC Hydro's own power generation and internal operations (e.g., corporate motor vehicle use, office building space heating, loss of SF_6 from transmission equipment). Indirect emissions are those associated with BC Hydro's purchases of electricity for domestic use that have been generated with fossil fuels.

Direct emissions from **fossil fuel combustion** are calculated by multiplying generation (in GW•h) by an emission factor (in tonnes per GW•h). This method applies both to BC Hydro facilities and to electricity purchases. The calculated emission factor depends on the fuel being used and the efficiency of the operation. In the case of generation at BC Hydro facilities, the emission factor is calculated by BC Hydro for each generation source. Facility-specific data are used where possible along with Environment Canada information, such as emission factors for different fuels and for different greenhouse gases.

Direct emissions from **motor vehicle use** and **gas consumption** (for space heating) are calculated by multiplying the volume of fuel consumed by the appropriate emission factor from Environment Canada. Estimates of direct emissions of SF_6 are based on annual leakage from electrical equipment. This year's inventory reflects an update of our estimate of current and historic levels of SF_6 emissions. As noted earlier, we launched an SF_6 monitoring program in 1999. Preliminary data from the program suggest that we were previously underestimating recent SF_6 emissions. Given that we have reduced SF_6 losses over the last decade, we can assume that our levels were also higher historically. This year's revised inventory reflects these findings.

When calculating the indirect emissions associated with BC Hydro's purchases of electricity from **non-fossil fuel** generating sources, **hydropower** is considered to be GHG neutral, and **woodwaste combustion** is considered to have very low GHG emissions. Based on Environment Canada emission factors, woodwaste-based power is attributed with a methane (CH_4) emission factor of 0.2 kg/GW•h (which equals 4.2 tonnes CO_2e/GW•h).

Note: By definition, indirect emissions are double counted in VCR reporting. That is, independent power producers and other utilities that sell electricity to BC Hydro and are registered with VCR Inc. will report BC Hydro's indirect emissions as their direct emissions.

Offsets (Line D)

Purchased emission reductions include all offsets generated at non-BC Hydro facilities and purchased by BC Hydro. To date, this includes emission reductions from the capture and combustion of methane at the Port Mann landfill in Surrey, BC.

Carbon sequestration resulting from wetland creation in BC Hydro's Upper Arrow reservoir (south of Revelstoke, BC) is calculated by multiplying the carbon sequestration capacity (in tonnes of carbon per hectare) of the soil and of the biomass above and below ground by the area of established wetland vegetation (in hectares) and then by a conversion factor for carbon dioxide (in tonnes of carbon dioxide equivalent per tonne of carbon). The gradual increase in carbon sequestration over time is based on the growth rates of the vegetation.

Net Emissions (Line E)

The numbers in Line E represent our net contribution of greenhouse gases to the atmosphere, which we calculate by subtracting our offsets (Line D) from our actual emissions (Line C).

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Greenhouse Gas Inventory – A Guided Tour

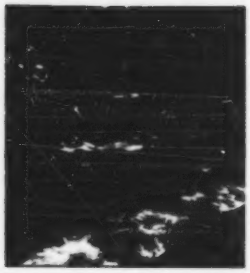
Base Year

The emissions in a representative base year (usually 1990) are used as a reference point for measuring changes in emissions over time and for setting targets. The selection of a representative base year is not a straight-forward decision for BC Hydro. In 1990, BC Hydro experienced a high water year and 97 per cent of total generation (an unusually high percentage) was met by hydroelectric facilities. Consequently, the GHG emissions for the BC Hydro system were low (863 kt of CO_2e) and not reflective of typical conditions at that time. For this reason, BC Hydro has chosen to adopt a representative base year emissions level of 1,425 kt of CO_2e. This figure represents the five year average of actual emissions for the period 1989 to 1993, which is more representative of typical operating conditions in 1990.

Base Year Greenhouse Gas Emissions

Actual Emissions for BC Hydro System	**Unit**	**1989**	**1990**	**1991**	**1992**	**1993**
CO_2 Emissions	**kt**	**2,339**	**779**	**473**	**1,007**	**2,085**
CH4 (as CO_2 equivalents)	kt	2	1	1	1	1
N20 (as CO_2 equivalents)	**kt**	**19**	**12**	**11**	**16**	**20**
SF_6 (as CO_2 equivalents)	kt	119	117	115	113	111
GHG Emissions (as CO_2 equivalents)	**kt**	**2,479**	**909**	**600**	**1,137**	**2,217**
GHG Intensity	t/GW•h	55	19	12	22	47
Base Year BC Hydro System Emissions (1989-1993 Average)	**kt**			**1,468**		
Base Year BC Hydro System GHG Intensity (1989-1993 Average)	**t/GW•h**			**31**		

As noted in the discussion of direct emissions in the section on "Actual Emissions (Line C)" (p. 20), this year's inventory reflects updated numbers for both current and historic levels of SF_6 emissions. These changes are also reflected in the table above



Greenhouse Gas Inventory – A Guided Tour (continued)

Base Year

The emissions in a representative base year (usually 1990) are used as a reference point for measuring changes in emissions over time and for setting targets. The selection of a representative base year is not a straight-forward decision for BC Hydro. In 1990, BC Hydro experienced a high water year and 97 per cent of total generation (an unusually high percentage) was met by hydroelectric facilities. Consequently, the GHG emissions for the BC Hydro system were low (863 kt of CO_2e) and not reflective of typical conditions at that time. For this reason, BC Hydro has chosen to adopt a representative base year emissions level of 1,425 kt of CO_2e. This figure represents the five year average of actual emissions for the period 1989 to 1993, which is more representative of typical operating conditions in 1990.

Base Year Greenhouse Gas Emissions

CH4 (as CO_2 equivalents)	kt	2	1	1	1	1
SF_6 (as CO_2 equivalents)	kt	119	117	115	113	111
GHG Intensity	t/GW•h	55	19	12	22	47

This table provides an inventory of actual GHG emissions by gas type for the total BC Hydro System for the years 1989 to 1993, including direct and indirect emissions. Also shown is the five-year average (1989-1993) of actual emissions and emission intensity, which BC Hydro uses as its base year.

As noted in the discussion of direct emissions in the section on "Actual Emissions (Line C)" (p. 20), this year's inventory reflects updated numbers for both current and historic levels of SF_6 emissions. These changes are also reflected in the table above.

[redacted]

Calculating Emissions by Gas Type

All the emissions and emission reductions in our inventory are reported in kilotonnes of carbon dioxide equivalent (kt CO_2e) and represent the sum of all greenhouse gas emissions associated with that facility or activity. For example, at one of our thermal generation plants, types of greenhouse gases emitted include CO_2, CH_4 and N_2O. The amount of each greenhouse gas that we emit or avoid emitting on an annual basis is calculated by multiplying the amount of power generated or saved (GW·h) by emission factors (tons or kilograms per GW·h) specific to each facility. These emission factors are based on Environment Canada emission factors for fuels and customized using BC Hydro data on the efficiency of specific facilities. The contribution of non-CO_2 greenhouse gases is then converted into tonnes of CO_2e using the latest Global Warming Potentials published by the Intergovernmental Panel on Climate Change.

Categorizing our Emission Reductions

In the section describing our emissions earlier in this report (p.6), the difference between direct and indirect emissions was discussed. Direct emissions are those from our own facilities and operations; indirect emissions are those associated with our power purchases.

There is also a distinction to be made between different categories of emission reductions: direct and indirect emission reductions, and sequestration. Direct emission reductions occur when efforts are made to reduce emissions at the source; for example, improving the efficiency of a thermal generation plant to reduce the amount of fossil fuel consumed (and the emissions produced) to generate each unit of electricity. Indirect emission reductions occur when efforts are made to reduce the amount of energy that is consumed, and therefore the amount of emissions produced; for example, when customer efficiency programs result in a lowered demand for power. Sequestration occurs when emissions produced at one source are captured and stored at another; for example, when carbon is sequestered by a forest or wetland. Based on those categories, BC Hydro's internal emission reductions and offsets fall into the following categories:

[redacted]

Burrard Generating Station Improvements

[redacted]

Customer Efficiencies (Power Smart)

Internal Efficiencies (Resource Smart)

Purchase & Development of Cleaner Power

Purchased Emission Reductions

[redacted]

Carbon Sequestration at Reservoirs

Glossary

capacity: the maximum sustainable amount of power that can be produced or carried at any instant

carbon dioxide equivalent (CO_2e): for comparability, emissions are reported on a CO_2 equivalent (CO_2e) basis, as other GHGs have greater global warming potential than CO_2 on an equivalent-weight basis

cogeneration: simultaneous production of electricity and useful steam from a single fuel source

combined cycle gas turbine: a combination of a combustion and a steam turbine to generate electricity from two thermodynamic cycles; exhaust gases from the combustion turbine are directed to a heat recovery steam generator which produces steam to power a steam turbine

distribution: transportation and delivery of electricity at voltages under 60 kilovolts (kV)

greenhouse gas (GHG): gases which trap heat in the atmosphere; arising mainly from combustion of fossil fuels, they include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO_2) and chlorofluorocarbons (CFCs)

GHG intensity: a measure of the amount of emissions released during the generation of a given amount of energy; usually measured in tonnes of CO_2e per GW•h

GHG offset: project that mitigates excess emissions from one source by lowering, avoiding, or sequestering (capturing and storing) emissions at another source

gigawatt-hour (GW•h): one billion units of electric power, supplied or produced for one hour; BC Hydro measures the output of a generating station in GW•h

hydroelectricity: electricity produced by harnessing the power of falling water or streamflow

independent power producer (IPP): operator of a privately-owned electricity generating facility which is usually connected to a utility's transmission system to sell electricity

inflow: water flowing into a reservoir

kilotonne (kt): 1,000 metric tonnes

kilotonnes carbon dioxide equivalent (kt CO_2e): standard measure for GHG emissions, expressing the global warming potential of various gases over 100 years in terms of carbon dioxide equivalents; i.e., one tonne of methane has 21 times the atmospheric impact of one tonne of CO_2 and is expressed as 21 CO_2e; nitrous oxide (N_20) is 310, and SF_6 is 23,900

Kyoto Protocol: international climate change agreement which, if ratified, will put legal limits on the volume of GHG emissions that can be produced by countries

line losses: loss of energy in a power system due to resistance in the transmission and distribution wires; reduced line losses result in lower generation requirements, thus decreasing GHG emissions

Megawatt (MW): 1,000 kilowatts (KW), or 1 million watts; a watt is the commercial unit of electric power; capacity is usually expressed in megawatts

sulphur hexafluoride (SF_6): a greenhouse gas that is used as an insulating and protective gas in transmission equipment

single cycle gas turbine: a combustion turbine that generates electricity using natural gas (see combined cycle gas turbine)

turbine: rotary device turned by the movement of gases, steam, water or wind

thermal generation: generation of electricity by converting heat energy into electric energy; generation through burning of fossil fuel or biomass (e.g. woodwaste)

transmission: transportation or conveyance of electricity in bulk at voltages over 60 kilovolts (kV)

Voluntary Challenge and Registry (VCR) Inc.: a non-government organization that encourages Canadian companies to voluntarily reduce GHG emissions and report on their progress

Watt: unit for measuring electric power